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The study assessed the general intellectual ability of Indian and Metis pupils of the Northwest Territory (N.W.T.), Canada. While minimizing cultural bias, an attempt was made to identify economical tests for this cultural group which would demonstrate (1) minimal loading on verbal and other culture-bound factors, (2) moderate relationship to school achievement, and (3) relative insensitivity to age. The sample for this study consisted of 239 Indians or Metis of both sexes attending school in Grades 1 to 9 at Ft. Simpson, N.W.T. It was found that the Progressive Matrices Test and the Safran Culture-Reduced Intelligence Test best met the criteria established for culture-reduced measures of intellectual potential; however, it was concluded that the production of norms appropriate to the Indian-Metis would be essential before putting these tests into general use. (JM)

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Assessing the Intellectual Ability of Indian and Metis Pupils at Fort Simpson N.W.T.

A Report by
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University of Alberta

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CURRICULUM SECTION
Education Division
Northern Administration Branch
Department of Northern Affairs
and National Resources
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ASSESSING THE INTELLECTUAL ABILITY OF INDIAN AND METIS PUPILS AT FT. SIMPSON, N.W.T.

A Report by Dr. R.S. MacArthur
of the University of Alberta on a
study conducted at the request of
the Education Division, Department
of Northern Affairs and National
Resources

Curriculum Section - Education Division
Northern Administration Branch
Department of Northern Affairs and National Resources
Ottawa, August, 1962

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FOREWORD

Reported herein is a study entitled "Assessing the Intellectual Ability of Indian and Metis Pupils at Fort Simpson, N.W.T." This study was conducted by Dr. R.S. MacArthur, Professor, of Educational Psychology at the University of Alberta, at the request of the Education Division of the Department of Northern Affairs and National Resources.

Previous to this study, Mr. D.J.S. Jackson, the Education Division specialist in Measurement and Evaluation, had undertaken preliminary work toward the selection of a suitable intelligence test for use in our northern schools. A thorough review was made of the available pertinent literature along with a careful examination of appropriate studies carried out elsewhere. Keeping in mind certain criteria for test selection, several tests which appeared to have some potential for use in our schools were found.

Concurrent with Mr. Jackson's work in this field, Dr. MacArthur was conducting studies on the general problem of measuring the intelligence of pupils who, in one or more ways, cannot be satisfactorily tested through the use of conventional intelligence tests. Some of the tests used by Dr. MacArthur were the same as those which had interested the Education Division. For this reason, and because Dr. MacArthur is recognized as being one of Canada's outstanding scholars in his field, he was asked by the Education Division to undertake the study reported here. Mr. Jackson acted in a liaison capacity for the Department.

A report on a subject of this nature must, of necessity, be technical and the reader will soon discover that reference is made to statistical procedures which are unfamiliar to most teachers and laymen. Nevertheless, the report contains much of general interest that can be readily understood by anyone. In particular, the sections on "the Problem", "Rationale", "Summary" and "Conclusions" should prove of considerable interest.

As can be seen from this report, a few "Culture-reduced" intelligence tests have been determined, on the basis of the accumulated evidence to date, as being among the best available for use in our schools. It is interesting to note that the test which headed the independently prepared list referred to above is also the test which appears to have the greatest potential as

evidenced by Dr. MacArthur's study. However, this is qualified to some extent by the fact that for any test to be of value, adequate norms must be established. Accordingly, steps have been taken to norm three potentially suitable tests. At the time of writing it appears that adequate norms will be produced during the 1962-63 school year for one of these tests for use in the Mackenzie District.

Dr. MacArthur has placed a quotation in his report at the bottom of page 17 which has much significance for our teachers,

> Considering the 239 Indian-Metis in this part of the study, in 99 cases the Assessed Culture-Reduced I.Q. exceeded the Assessed Conventional I.Q. by 16 points or more, in 25 cases by 32 points or more. Twenty Indian-Metis, though appearing average on the Conventional Tests, appear quite clearly to have potential for university study on the Culture-Reduced Tests; this information doesn't tell us what to do with these people, but at least it has helped us to locate them.

When suitable tests are administered to other pupils the resulting scores, based on adequate norms, will identify many as possessing potential for university or other post-secondary education. As Dr. MacArthur mentions, the mere identification of such pupils does not tell us what they should be taught or by what methods. Teachers should do everything possible to ensure that our high-potential students are given the background necessary for success in advanced work. We will be most pleased to learn of the "adaptive treatments" which our teachers find to be the most successful. Further, teachers experiencing difficulties in teaching these brighter pupils should not hesitate to seek the assistance of their principal and superintendent.

Dr. MacArthur suggests additional research that could very profitably be undertaken. Some of this will be carried out as time and facilities permit. In passing, it may not be inappropriate to suggest that any teacher with an interest in this general field might make this interest known. It may be possible to offer some assistance to those who wish to conduct appropriate studies for thesis or other purposes.

We acknowledge with gratitude the co-operation of the Fort Simpson staff in administering the tests for Dr. MacArthur's study and in supplying other necessary data.

The Department of Northern Affairs and National Resources is deeply indebted to Dr. MacArthur for his thorough and scholarly study. Already it has proven to be of much benefit because of the light that it has shed in an otherwise dark and foreboding area.

B. Thorsteinsson,
Chief, Education Division,
Northern Administration Branch,
Department of Northern Affairs
and National Resources,
Ottawa, August, 1962.

ASSESSING THE INTELLECTUAL ABILITY OF INDIAN AND METIS PUPILS AT FT. SIMPSON, N.W.T.

R.S. MacArthur
University of Alberta

(Report submitted to Chief, Education Division, Canadian Department of Northern Affairs and National Resources, July, 1962)

A. THE PROBLEM

Canadian philosophies of education usually expect instruction in schools, especially up to legal school-leaving age, to be so adapted as to adequately capitalize on the intellectual potential of individual pupils. Such adaptive teaching requires an economical but valid assessment of that potential. For pupils from middle-class urban cultures reasonably valid instruments such as the highly verbal Stanford-Binet Intelligence Scales or the conventional group intelligence tests derived therefrom are available for this purpose. But how can a teacher gain a valid picture of the general intellectual capability of an immigrant, a slum child, an Indian or Metis, to assist in diagnosing his difficulties in reading or number, and in applying teaching techniques appropriately adapted to that capability?

The study herein reported is one in a series concerned with the assessment of general intellectual ability with minimum cultural bias. As a replication of another study carried out concurrently at Faust, Alberta, it sought to identify economical tests which for the Indian and Metis pupils attending school at Ft. Simpson, N.W.T. would demonstrate:

(a) that the tests were in fact measuring a broad aspect of intelligence common to a wide variety of mental tasks, while at the same time having minimal loading on verbal and other factors oriented toward a particular culture,

(b) that the tests were doing so with less bias against the Indian-Metis than that of commonly-used so-called intelligence tests,

(c) that they were moderately related to school achievement, and

(d) that they were showing less change in score with age, relative to white pupil performance, than were conventional intelligence tests.

As a by-product of the study, some data were obtained concerning the intellectual potential of individual pupils in the sample as assessed by the tests best meeting these criteria.

B. RATIONALE

Brief exposition of the rationale underlying the adoption of such criteria for selecting tests of intellectual potential for culturally-handicapped pupils may be in order. For purposes of this series of studies, intelligence is conceived as hierarchical in structure, with general intellectual ability, similar to Spearman's *g*, at the top of the hierarchy. Further down in the hierarchy are group factors or primary mental abilities, such as verbal, numerical, and spatial abilities, of various degrees of generality depending upon the tasks and persons used in defining them. Individual differences in abilities result from the interaction of innate predispositions and environment in a multiplicative rather than an additive manner. Sensory-motor and perceptual associations of early childhood are important in forming the essential bases of all cognitive abilities, but general intellectual ability, which may be explained in terms of extensive positive transfer of learnings, may be less influenced than abilities lower in the hierarchy by particular learnings from the environment.

When curricula and teaching methods are relatively fixed and we are predicting success in attaining immediate and specific goals such as end-of-next-year school examinations, empirical predictor-goal correlations and

expectancy tables, without theorizing about what is being measured, are quite satisfactory. But if we can implement a philosophy calling for curricula and teaching methods so adapted as to maximize realization of the intellectual potential of individual pupils, and we are predicting success in attaining distant and general goals of adult life, theoretical consideration of the constructs likely to be involved in predictor-goal relationships becomes useful, perhaps definitely necessary. A distinction is here being drawn between prediction to immediate and specific goals with relatively fixed intervening treatment on the one hand, and prediction to distant and general goals with relatively adaptive intervening treatment on the other, while a philosophy of elementary and junior high school education entailing the latter is being assumed.

Bringing the foregoing two paragraphs together implies that tests of intellectual potential for culturally-handicapped pupils, as aids to future adaptive teaching, should sample the general intellectual ability factor g. However, for such pupils this factor may not be representatively sampled through the school achievement, verbal reasoning in English, and English vocabulary usually forming the content of intelligence tests. Tests less dependent upon particular learnings should better allow pupils from cultures other than middle-class urban white to demonstrate their intellectual capabilities. Nevertheless, if pupils have had sufficient contact with school and other aspects of white culture to enable them to sit for group intelligence tests, such tests should have positive, though perhaps low, relationship with concurrent school achievement, since g is common to both the tests and school achievement.

C. DATA COLLECTION

(a) The Sample. The sample for this study consisted of 239 Indians or Metis of both sexes attending school in Grades 1 to 9 at Ft. Simpson, N.W.T.

in October of 1961. An Indian-Metis was simply defined as any pupil who in the opinion of his teachers was considered by the community "to have Indian blood in his veins"; in the analysis no distinction is made between Indian and Metis, both of whom are hereafter referred to as Indian-Metis. The socioeconomic status of the sample was very low, as indicated by its Blishen Occupational Index of mean 35 and standard deviation 4.2 (for Canada mean is 50 and standard deviation is 10). A language other than English (Slave, with some Dogrib, French and Chipewyan) was used in the home on the average "most of the time."

Data are herein presented for four separate groups in the sample:

(a) Grade 7, 8 and 9. 32 pupils of mean age 13-10

(b) Grade 5 and 6. 58 pupils of mean age 13-11. Included in this group were a class called a Vocational class, and another called a Pre-vocational class, both of which included older pupils doing school work well below the Grade 7 level.

(c) Grade 2 and 3. 46 pupils of mean age 10-2.

(d) Grade 1. 19 pupils of mean age 7-6.

Grade 4 is omitted since complete comparable data for a white sample were not available. Also omitted are a Basic English class, a sight-saving class, those Grade 1's who, having been in school only a few months, could not cope with some of the tests, and a few additional pupils in other grades for whom complete test scores were not available because of absence. The original sample of 239 is thus reduced to a total of 155 for purposes of this analysis.

Data as of May, 1961 for the four comparable groups of Indian-Metis in the Faust study are included in this report. The similarity of the results for these two samples, of different tribal affiliations and living 500 miles apart, is striking. Since for both samples the number of cases in each group is small, replication has increased considerably the confidence which can be placed in the results.

(b) The Tests. In October of 1961, appropriate levels of a number of tests of intellectual ability which were hypothesized as "culture-reduced" were administered to the Ft. Simpson pupils by their regular classroom teachers, under the supervision of the writer. These "culture-reduced" tests required the pupils to reason, to learn and adapt as they went along, to form concepts, to see relationships and principles, and to use these principles in problems. But they did so through the media of simple designs such as squares, triangles, and circles rather than through verbal problems or pictures of objects from an urban environment. At the same time several conventional intelligence tests were administered, and in December 1961 a number of measures of school achievement were obtained. The actual tests used for the four groups are given below:

Grade 7, 8, and 9 -

1. Standard Progressive Matrices (1956).
2. IPAT Cattell Test of "g", Scale 2 (1949).
3. Lorge-Thorndike Non-Verbal Intelligence Tests, Level 4 (1954).
4. Safran Culture-Reduced Intelligence Test (1960).
5. California Short-Form Test of Mental Maturity, Elementary (1957). Non-Language and Language parts.
6. Otis Quick-Scoring Mental Ability Tests Beta (1954).
7. California Achievement Battery, Junior High (1957), Reading, Arithmetic and Language parts.

Grade 5 and 6 -

1. Standard Progressive Matrices (1956).
2. IPAT Cattell Test of "g", Scale 2 (1949).
3. Lorge-Thorndike Non-Verbal Intelligence Tests, Level 3 (1954).
4. Safran Culture-Reduced Intelligence Test (1960).
5. California Short-Form Test of Mental Maturity, Elementary (1957). Non-Language and Language parts.
6. Otis Quick-Scoring Mental Ability Tests, Beta (1954).
7. California Achievement Battery, Elementary, (1957), Reading, Arithmetic and Language parts.

Grade 2 and 3 -

1. Coloured Progressive Matrices (1947).
2. Lorge-Thorndike Intelligence Tests, Level 2 (1954).
3. Safran Culture-Reduced Intelligence Test (1960).
4. California Short-Form Test of Mental Maturity, Primary (1953). Non-Language and Language parts.

5. Otis Quick-Scoring Mental Ability Tests, Alpha Short Form (1952). Non-Verbal and Verbal parts.
6. California Achievement Battery, Upper Primary for Grade 3, Lower Primary for Grade 2 (1957). Reading, Arithmetic and Language parts.

Grade 1 -

1. Coloured Progressive Matrices (1947).
2. Lorge-Thorndike Intelligence Tests, Level 1 (1954).
3. Safran Culture-Reduced Intelligence Test (1960).
4. California Short-Form Test of Mental Maturity, Pre-Primary (1957). Non-Language and Language parts.
5. Detroit Beginning First-Grade Intelligence Test (1937).
6. California Achievement Battery, Lower Primary (1957). Reading, Arithmetic, and Language parts.

D. ANALYSIS AND INTERPRETATION

(a) The Factor Analyses. For each of the four groups the intercorrelations of the various tests were obtained(after appropriate attention to scaling and to shapes of the distributions). These intercorrelations were then examined by factor analysis using the University of Alberta's IBM 1620 electronic computer, to determine the extent to which common influences seemed to be running through the various tests. In these studies factor analysis is viewed as just a helpful means of classifying the way persons behave in test situations. As with many other classification procedures, the same data may often be classified in several ways; the particular classifications herein selected are ones considered likely to be meaningful and useful to teachers and others working with culturally-handicapped pupils in school systems, and of course at the same time consistent with the data.[1] Examination of the rotated factor matrices displayed in Tables I to IV provides evidence of the degree to which the various tests for the various

[1] Eight principal component factor analyses were performed (one for each of the four groups at both Ft. Simpson and Faust), using the Jacobi method of obtaining eigenvalues and eigenvectors of real symmetric matrices. Unities were inserted in the diagonal cells, and factors whose corresponding eigenvalues were greater than unity were considered significant. One additional factor was sometimes retained to assist in the rotations.

Orthogonal rotations were carried out graphically, using the criteria of high variance for a general factor, positive manifold, and psychological meaning to assist rotation.

age and grade groups can be interpreted as meeting the first criterion of measuring a broad aspect of intelligence common to a variety of mental tasks (high g loading), while at the same time having minimal loading on verbal and other factors oriented toward a particular culture.

Table I presents the rotated factor matrix for the Grade 7, 8, 9 group in both the Ft. Simpson and the Faust samples. (There were no Grade 9's in Faust). Since for both samples the N's are small, loadings below .3 are omitted. Test II is the Test of General Ability, administered in Faust but not in Ft. Simpson. The similarity of the factor patterns is evident. For both samples Factor I is interpreted as the general intellectual ability factor g, running positively through all of these mental tasks. Factor II, running through the verbal and school-like tests resembles closely the verbal : educational factor commonly identified by British factor analysts, but is likely better labelled a verbal : cultural factor in this context. Factor III is clearly a number factor for the Faust sample, but is not interpretable for the Ft. Simpson sample. The columns headed h^2 indicate the communalities of the respective tests, each communality having maximum value of 1., and providing an index of the degree to which the test is measuring things in common with other tests in the battery.

Table I shows that for this age and grade group Progressive Matrices, the Cattell Test, and SCRIT are highly loaded on the general intellectual ability factor, but have negligible loadings on the other group factors. The Lorge-Thorndike has quite high g loading, but has some loading on v:cl for the Ft. Simpson sample, and some loading on n for the Faust sample.

In Table II the rotated factor matrix for the Grades 5 and 6 samples are presented. Again the similarity of pattern for the two samples is striking; Factors I and II are clearly g and v:cl, while Factor III is likely a spatial factor labelled k. For the Faust sample a small fourth factor, quite uninterpretable, opposing California Language and Reading,

TABLE I

GRADE 7,8,9, ROTATED FACTOR MATRIX
(Loadings below .3 omitted)

Ft. Simpson N = 30, Mean Age = 13-10; Faust N = 23, Mean Age = 14-4

Factor Sample Inter-pretat-ion		I		II		III		h^2	
		Simps. g	Faust g	Simps. ∀:cl	Faust v:cl	Simps. ?	Faust n	Simps.	Faust
1. Prog. Mat.	T	.77	.82	---	---	---	---	.64	.72
2. Cattell	T	.83	.80	---	---	---	---	.77	.71
3. L-Th	T	.76	.65	.39	---	---	.54	.77	.74
4. SCRIT	R	.78	.90	---	---	---	---	.69	.92
5. CTMM N-L	T	(.15)	.69	---	---	.93	.55	.94	.83
6. CTMM Lang.	T	.40	.67	.82	.64	---	---	.87	.86
7. Otis	R	.39	.52	.84	.77	---	---	.87	.87
8. Calif. Rdg.	G	.54	.52	.76	.72	---	---	.89	.81
9. Calif. Arith.	G	.71	.51	.44	.46	---	.58	.70	.80
10. Calif. Lang.	G	.65	.51	.58	.49	---	.59	.77	.84
11. TOGA	R		.37		.77		---		.73
Prop. Common Var.		.51	.53	.35	.31	.14	.16	1.00	1.00
Prop. Total Var.		.40	.42	.28	.25	.11	.13	.79	.80

NOTE: In Tables I to IV, indicates T-score based on Calgary or Edmonton samples, G indicates grade placement according to publisher's norms, and R indicates raw score.

was found. Progressive Matrices, Cattell, Lorge-Thorndike, and SCRIT all have large g loadings and negligible group factor loadings, except for the small k loading of Cattell.

TABLE II

GRADE 5,6, ROTATED FACTOR MATRIX
(Loadings below .3 omitted)
Ft. Simpson N = 58, Mean Age = 13-11; Faust N = 29, Mean Age = 12-10

Factor Sample Interpretation		I Simps. g	I Faust g	II Simps. v:cl	II Faust v:cl	III Simps. K	III Faust K	IV Faust ?	h^2 Simps.	h^2 Faust
1. Prog. Mat.	T	.77	.84	---	---	---	---	---	.66	.80
2. Cattell	T	.73	.74	---	---	.35	.41	---	.65	.78
3. L-Th.	T	.87	.88	---	---	---	---	---	.82	.83
4. SCRIT	T	.77	.78	---	---	---	---	---	.67	.78
5. CTMM N-L	T	.39	(.19)	---	---	.84	.90	---	.87	.91
6. CTMM Lang.	T	.31	.57	.79	.51	---	---	---	.73	.68
7. Otis	R	.58	.41	.70	.66	---	---	.39	.84	.82
8. Calif. Rdg.	G	.48	.40	.78	.43	---	---	.76	.87	.96
9. Calif.Arith.	G	.62	.82	.62	---	---	---	---	.83	.76
10. Calif. Lang.	G	.50	(-.09)	.70	.56	---	---	.71	.75	.91
11. TOGA	R		.77		.35		---	---		.75
Prop. Common Var.		.51	.51	.35	.18	.14	.15	.16	1.00	1.00
Prop. Total Var.		.39	.42	.27	.15	.11	.12	.13	.77	.82

For the Grade 2 and 3 samples, as indicated by Table III, Factors I and II are again clearly the g and v:cl factors. The nature of Factor III is not so clear, but the tests having high loadings on this factor, at this grade-level, all require considerable comprehension of oral English. Progressive Matrices, SCRIT, and Otis Non-Verbal all have high g loadings with negligible group factor loadings.

TABLE III

GRADE 2,3 ROTATED FACTOR MATRIX
(Loadings below .3 omitted)

Ft. Simpson N = 46, Mean Age = 10-2; Faust N = 42, Mean Age = 9-4

Factor Sample Interpretation		I		II		III		h^2	
		Simps. g	Faust g	Simps. v:cl	Faust v:cl	Simps. Comprehe.	Faust Oral Eng.	Simps.	Faust
1. Prog. Mat.	T	.82	.92	---	---	---	---	.75	.89
2. L-Th.	T	.39	.69	.70	.33	---	---	.65	.60
3. SCRIT	T	.82	.87	---	---	---	---	.67	.80
4. CTMM N-L	T	.58	.79	---	---	.60	---	.71	.67
5. CTMM Lang.	T	(.15)	.78	.62	.31	.58	---	.74	.71
6. Otis Verb. Simps.	R	.51		.34		.55		.67	
Detroit Beg. Faust IQ			.51		---		.71		.77
7. Calif. Rdg.	G	.56	.79	.63	.48	---	---	.75	.90
8. Calif. Arith.	G	.41	.80	.66	.40	---	---	.61	.87
9. Calif. Lang.	G	.56	.75	.71	.55	---	---	.85	.87
10. Otis N-V Simps.	R	.69		---		---		.59	
TOGA - Faust	R		.30		---		.88		.87
Prop. Common Var.		.48	.69	.35	.12	.17	.19	1.00	1.00
Prop. Total Var.		.34	.55	.24	.10	.12	.15	.70	.79

TABLE IV

GRADE I ROTATED FACTOR MATRIX
(Loadings below .3 omitted)

Ft. Simpson N = 19, Mean Age = 7-6; Faust N = 32, Mean Age = 7-9

Factor Sample Interpretation		I		II		h^2	
		Simps. g	Faust g	Simps. v:cl	Faust Comp. Oral Eng.	Simps.	Faust
1. Prog. Mat.	T	.84	.68	---	---	.72	.47
2. L-Th.	T	.55	.67	.50	.35	.55	.57
3. SCRIT	T	.94	.62	---	.41	.90	.55
4. CTMM N-L	R	.72	(.23)	.49	.40	.76	.21
5. CTMM Lang.	R	.88	.35	.33	.70	.88	.57
6. Detroit	R	.56	(.17)	.68	.88	.78	.80
7. Calif. Rdg.	G	.76	.84	.55	---	.89	.76
8. Calif. Arith.	G	.59	.74	.75	.31	.92	.65
9. Calif. Lang.	G	.35	.86	.71	---	.63	.76
10. TOGA	R	..	.66	.	---	.	.45
Prop. Common Var.		.65	.68	.35	.32	1.00	1.00
Prop. Total Var.		.50	.39	.30	.19	.80	.58

For the Grade I samples, Table IV shows only two significant factors, the first being g. The second has been labelled v:cl for the Ft. Simpson sample, and rather dubiously comprehension of oral English for the Faust sample. Progressive Matrices and SCRIT both have g loadings with negligible group factor loadings for the Ft. Simpson sample, but SCRIT has some loading on the second factor for the Faust sample.

(b) Relative Bias against Indian-Metis. To see how well the various tests hypothesized as culture-reduced met the second criterion, that of less bias against the Indian-Metis than that of conventional intelligence tests, scores for the tests for which entries appear in Table V were obtained on samples totalling 780 pupils representative of Grade 7 pupils of Edmonton, and Grades 6, 3, and 1 pupils of Calgary. These were converted to scaled scores called T-scores, so that the means for the white urban groups on these tests were all 50 for each test, with standard deviations of 10. In effect the tests were all normed on the same Edmonton or Calgary groups, with the norms scaled to comparable form. By expressing the Indian-Metis scores in terms of these white urban T-scores, the cultural bias of the various tests could be compared. Table V gives for each of the groups for both the Ft. Simpson and the Faust samples, the mean T-scores based on the white urban samples, whose means were of course 50 in each instance. The data in this table are extracted from the M. Ed. thesis of Mr. Lloyd West.

For the Grade 7, 8, and 9 samples the asterisks indicate differences from the California Test of Mental Maturity Total significant at the .01 level, as determined by two-way analysis of variance and Duncan's multiple-range test. SCRIT scores were not available for the Edmonton sample. For the Ft. Simpson sample, the means of all the other tests hypothesized as culture-reduced differ significantly from that of the conventional CTMM Total; the pattern for the Faust sample is similar, although differences for means of the Progressive Matrices and the Cattell Test do not quite reach statistical significance for this group.

TABLE V

MEAN T-SCORES BASED ON EDMONTON OR CALGARY SAMPLES
(White urban means are 50 in each instance)

	Gr. 7, 8, 9 in Edmonton T		Gr. 5 and 6 in Calgary T		Gr. 2 and 3 in Calgary T		Gr. 1 in Calgary T	
	Simps.	Faust	Simps.	Faust	Simps.	Faust	Simps.	Faust
1. Prog. Mat.	45*	41	40*	37*	36*	35*	41*	41*
2. Cattell	41*	41	39*	38*				
3. L-Th	45*	42*	27	31	24	33	35*	39*
4. SCRIT			39*	36*	40*	38*	41*	49*
5. CTMM N-L	41*	43*						
6. CTMM Lang.	30	33						
7. CTMM Total	31	36			21	29		
8. Detroit							27	35
	*Sig.Diff.from CTMM Total at .01 level		*Sig.Diff.from L-Th. Total at .01 level		*Sig.Diff.from CTMM Total at .01 level		*Sig.Diff.from Detroit at .01 level	

For the Grade 5 and 6 samples, scores on conventional intelligence tests for the complete Calgary sample were not available, so that comparison of the culture-reduced tests with a conventional test was not possible. Differences for the Progressive Matrices, Cattell, and SCRIT with the Lorge-Thorndike are all significant. The bias of the Lorge-Thorndike which seems apparent from the approach of Table V disagrees with the findings of Table II, where for both samples this test had the highest g loading, and no loadin[illegible] the verbal:cultural factor.

For the Grade 2 and 3 samples means for the Matrices and the SCRIT differ significantly from those for the conventional CTMM Total, while for the Grade I samples means for these two tests and for the Lorge-Thorndike differ significantly from those for the conventional Detroit.

This analysis has indicated that the culture-reduced tests, though

also biased against the Indian-Metis, contain much less bias than do the conventional tests with which they were compared.

(c) Relationship with School Achievement. A culture-reduced test may not be expected to show very high correlation with school marks since the latter are themselves weighted by language and cultural bias, but such correlations should be positive and moderately high. Table VI shows this to be the case, where all six of the culture-reduced tests have moderately high positive correlations with California Achievement Total, but these correlations are generally, though not always, lower than those for conventional verbal tests.

TABLE VI

CORRELATIONS WITH CALIFORNIA ACHIEVEMENT TOTAL

	Gr. 7, 8 and 9		Gr. 5 and 6		Gr. 2 and 3		Gr. 1	
	Simpe.	Faust	Simpe.	Faust	Simpe.	Faust	Simpe.	Faust
1. Prog. Mat.	.42	.60	.26	.61	.31	.71	.55	.52
2. Cattell	.38	.55	.41	.44				
3. L-Th.	.75	.63	.59	.70	.66	.66	.54	.63
4. SCRIT	.49	.29	.35	.50	.48	.64	.42	.53
5. CTMM N-L	.30	.44	.42	.21	.40	.59	.69	.13
6. Otis N-V					.45			
7. CTMM Lang.	.77	.79	.69	.68	.47	.76	.78	.37
8. CTMM Total	.78	.80	.64	.57	.55	.77	.79	.35
9. Otis	.77	.76	.81	.76	.57			
10. Otis Verbal					.49			
11. Detroit						.44	.75	.02

(d) Change with Age. Since this was a cross-sectional study, it was not possible to examine the stability of scores on the various tests for individual pupils over a period of years. This might be possible at a future date. However, some evidence on the comparable stability of scores on culture-reduced and on conventional tests over a five-year period was obtained through comparing performance of the Grade 2 and 3 group with that of the Grade 7, 8 and 9 group on several tests taken by both groups.

For five conventional tests or sub-tests (CTMM Lang., CTMM Total, CTMM Verbal, CTMM Numerical, CTMM Logical) the mean increase in mean T-score from Grade 2, 3 to Grade 7, 8, 9 was obtained. For five culture-reduced tests or sub-tests (Progressive Matrices, L-Th. sub-test II, L-Th. sub-test III, CTMM N-L, CTMM Spatial) the corresponding mean increase in mean T-score from Grade 2, 3 to Grade 7, 8, 9 was obtained. For the Ft. Simpson sample the difference between these two mean increases was 7.9, for the Faust sample 5.3. For both samples the conventional tests showed greater mean increase with increasing age than did the culture-reduced tests. (The difference is statistically significant at the .05 level for the Faust sample, but because of greater variance, not for the Ft. Simpson sample). The culture-reduced tests are more stable, have been less affected by alterations in environment, over the five-year period, than are the conventional tests.[1]

(e) Other Criteria. No direct reliability studies of the tests used in this investigation were made for the samples concerned. One of the criteria for initial selection of all tests for inclusion, however, was

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[1]The vocabulary of this paragraph is tricky, as are some of the assumptions underlying its computations. This procedure, though providing evidence concerning relative stability over time, is no proper substitute for longitudinal study of individual pupils for this purpose.

satisfactory reliability as indicated by studies elsewhere. Minimum estimates of reliability for these samples are provided by the communalities quoted in Tables I to IV; the reliabilities may be much higher than these communalities, but will not be lower. The consistent similarity of results for the two different samples, in spite of the small numbers of pupils involved in each group, provides general evidence for quite satisfactory reliability for all tests reported herein.

One important criterion for tests for use in such settings is face validity - the test should appear to pupils, to teachers, and to interested laymen in the community, to be assessing a basic ability to reason, through media entailing minimal handicap for such pupils. Progressive Matrices and SCRIT appeared best in this connection, especially the former. Indian-Metis pupils and their teachers found these tests interesting, and a rightful skepticism of such studies on the part of interested laymen often dissolved if one could get them to themselves start working through Progressive Matrices.

Of the tests studied, the Standard Progressive Matrices proved to be the easiest for classroom teachers to administer.

One major drawback for all tests included in the study is lack of norms appropriate for Indian-Metis of the Canadian North. A raw test-score by itself is meaningless to a teacher, a counsellor, or a principal, unless there exists some appropriate point of reference with which the score can be compared. Although for most of the tests studied publisher's norms exist (based on widely differing white groups - from Scotland to United States to Calgary), if any of these tests are to be used to assist in assessing the intellectual potential of the Indian-Metis, the production of appropriate norms is essential.

(f) Assessed I.Q.'s of Individual Pupils. Though the major purpose of this investigation was to study tests, rather than to assess the

intellectual potential of individual pupils until more was known about the tests, some information in the latter connection was obtained, and perhaps should be reported. In December, using the various publisher's norms, the Intelligence Quotient of each of the 239 Indian-Metis in the Ft. Simpson sample was assessed, based on the conventional tests and also based on the culture-reduced tests. The two assessed I.Q.'s for each pupil were reported to the school principal at that time.

Table VII presents the mean assessed conventional I.Q.'s and the mean assessed culture-reduced I.Q.'s for the Ft. Simpson and Faust samples. These may be compared with theoretical average I.Q.'s of 100 for the country as a whole. When it is remembered that it could not be claimed that the culture-reduced tests are by any means culture-free when used in this setting, these figures present rather strong evidence of considerable intellectual potential amongst these Indian-Metis samples.

TABLE VII

MEAN ASSESSED INTELLIGENCE QUOTIENTS OF INDIAN-METIS
(Based on Publishers' Norms with
M of 100 and S.D. of 16)

Sample N	Ft. Simpson 239	Faust 147
Assessed Conventional I.Q.	80	87
Assessed Culture-Reduced I.Q.	94	94

But perhaps of more practical interest than such statistics are the meangings for individual cases. A letter from the writer to the Department of Northern Affairs and National Resources concerning the Ft. Simpson sample reads in part:

> Considering the 239 Indian-Metis in this part of the study, in 99 cases the Assessed Culture-Reduced I.Q. exceeded the Assessed Conventional I.Q. by 16 points or more, in 25 cases by 32 points or more. Twenty Indian-Metis, though appearing average on the Conventional tests, appear quite clearly to have potential for university study on the Culture-Reduced Tests; this information doesn't tell us what to do with these people, but at least it has helped us to locate them.

E. SUMMARY

In October of 1961 a number of tests of intellectual ability hypothesized as "culture-reduced," along with some conventional measures of intelligence and achievement, were administered to the Indian-Metis pupils attending school at Ft. Simpson, N.W.T., with a view to identifying economical measures of intellectual potential having less cultural bias than tests commonly used for this purpose. Results are summarized in Tables VIII to XI for each of four groups in relation to several criteria set up for such culture-reduced tests.

Since the pattern of results for this Ft. Simpson replication of a concurrent study of Indian-Metis pupils at Faust, Alberta, closely resembles that for the Faust sample, for summary purposes the figures reported below, wherever possible, are weighted means of the respective Ft. Simpson and Faust figures. Though in a few instances such combination may be questionable, in general it adds clarity to the summary. Data for the two samples taken separately have appeared earlier in this report.

TABLE VIII

SUMMARY EVALUATION OF FIVE CULTURE-REDUCED TESTS:
GRADE 7, 8, 9 SAMPLES
(N = 53; Mean Age = 14-1)

Criteria	g Loading	Group Factors	Mean T-score Based on Edmonton	r Calif. Achiev. Total
1. Prog. Mat.*	.79	None	43	.50
2. L-Th. *	.71	.39 v:cl S .54 n F	44	.70
3. Cattell *	.82	None	41	.42
4. SCRIT	.83	None		.40
5. CTMM N-L	.39	None	42	.36
6. CTMM Total			33	.79

*Tests best meeting criteria.
SFt. Simpson sample only.
F Faust sample only.

TABLE IX

SUMMARY EVALUATION OF FIVE CULTURE-REDUCED TESTS:
GRADE 5 and 6 SAMPLES
(N - 87; Mean Age = 13-7)

Criteria	g Loading	Group Factors	Mean T-score Based on Calgary	r Calif. Achiev. Total
1. Prog. Mat.*	.79	None	39	.38
2. SCRIT *	.77	None	38	.40
3. L-Th.	.87	None	28	.63
4. Cattell	.73	.37 k	39	.41
5. CTMM N-L	.32	.86 k		.36

*Tests best meeting criteria

TABLE X

SUMMARY EVALUATION OF FIVE CULTURE-REDUCED TESTS:
GRADE 2 and 3 SAMPLES
(N = 88; Mean Age = 9-9)

Criteria	g Loading	Group Factors	Mean T-score Based on Calgary	r Calif. Achiev. Total
1. SCRIT *	.85	None	39	.56
2. Prog. Mat. *	.87	None	36	.50
3. Otis N-V	.69 S	None		.45 S
4. L-Th.	.53	.52 v:cl	28	.66
5. CTMM N-L	.68	.60 Oral Comp. S		.49
6. CTMM Total			25	.65

*Tests best meeting criteria.
S Ft. Simpson sample only.

TABLE XI

SUMMARY EVALUATION OF FOUR CULTURE-REDUCED TESTS:
GRADE 1 SAMPLES
(N = 51; Mean Age = 7-8)

	Criteria	g Loading	Group Factors	Mean T-score Based on Calgary	r Calif. Achiev. Total
(1)	Prog. Mat. *	.74	None	41	.53
(2)	SCRIT *	.74	.41 Oral Comp. F	46	.49
(3)	L-Th.	.63	.50 v:cl S .35 Oral Comp. F	30	.60
(4)	CTMM N-L	.41	.49 v:cl S .40 Oral Comp. F		.34
(5)	Detroit	.32	.68 v:cl S .88 Oral Comp. F	32	.29

*Tests best meeting criteria.
^{S}Ft. Simpson sample only; ^{F}Faust sample only.

1. The starred tests in Tables VIII to XI, in the order ranked, best meet the criteria established for culture-reduced measures of intellectual potential for the samples under study. In making such ranking, the criteria of high g loading and high T-score were considered most important.

2. Progressive Matrices is the single test clearly best meeting the criteria over the four groups studied. In addition it has face validity, is interesting, and is easy to administer.

3. SCRIT also meets the criteria well at all levels. Since it is a new test still in experimental stages and likely to undergo revision, its wide use for the time being might be most effective in the more clinical setting of individual testing. It appears to be a very promising culture-reduced test of general intellectual ability.

4. For the Grade 7, 8 and 9 group the Lorge-Thorndike Non-Verbal and the Cattell Test of g both rank high; for the Grade 5 and 6 group they may

still be satisfactory, though not meeting the criteria as well at this level. For the Grade 2 and 3 group the Otis Non-Verbal would appear from the evidence available to be next-best to Progressive Matrices for group testing at this time.

5. In so far as could be ascertained in a cross-sectional study the culture-reduced tests in general appeared less affected by alterations in environment over the period Grade 2, 3 to Grade 7, 8, 9, than were the conventional tests studied.

F. CONCLUSIONS

1. Until further much-needed research can improve upon them, use of the starred tests of Tables VIII to XI is recommended in the place of conventional verbal intelligence tests for assessing the intellectual potential of subjects such as those in the samples of this study.

2. However, before widespread use of these tests is feasible, the production of norms appropriate for the groups with whom they are to be used is essential.

3. Although these tests are still considered to be culturally biased when used in this context, they have indicated considerable intellectual potential amongst the Indian-Metis of Ft. Simpson and Faust.

4. Rather clearly indicated seems the need for extensive investigation of the means of best adapting treatment of the Indian-Metis to help them better realize the intellectual potential indicated by this study.

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